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Signed

Andrew Gersey

Dated

13 April 2005

Expanding Pipe Stopper

The present invention relates to an expanding pipe stopper for sewer pipes, industrial applications and the like, which are also known as drain plugs or bungs, and to a remote installation device for installing a pipe stopper within a pipe.

The invention will now be described by way of example, and with reference to the accompanying drawings.

Figures 1A and 1B

A side and rear view of a known pipe stopper 101 is shown in Figures 1A and 1B. The pipe stopper 101 is the subject of a co-pending patent application GB 03 06 424.5. The pipe stopper comprises a base circular plate 102 to which is rigidly attached a projection 103. The projection 103 extends through a hole in a top circular plate 104; the base and top plates being co-axially disposed. A flexible seal 105 is located between the plates 102 and 104 and mounted against their adjacent surfaces around their periphery.

A lever 106 is pivotally attached to the projection 103 and has a cam surface 107 which acts upon the front surface of the top plate 104. The lever 106 has a handle portion which is manually manipulated during use to rotate the lever about its pivot in direction of arrow 108. The cam surface 107 has a first portion 109 which rests upon the plate 104 when the pipe stopper is in a first stable configuration, as shown in Figure 1A and 1B. By manually rotating the lever in direction of arrow 108, the lever 106 is brought to a second stable position in which a second portion 110 of the cam surface pushes against the plate 104. The distance of the second portion 110 to the pivot is greater than the distance of the first portion 109 to the pivot, and therefore when the lever

106 is moved to the second position the plates are moved closer together. The flexible seal 105 is arranged to expand radially when the relative positions of the two plates is reduced in this way.

5 The pipe stopper 101 also comprises a contacting member 111 which extends from the top plate 104. In the present example, the contacting member 111 and the top plate 104 are integrally formed, being moulded from a single piece of plastics material.

10 During use, the pipe stopper 101 is located within a pipe in the first stable position shown in Figure 1A and 1B, such that the plates are perpendicular to the pipe axis. The lever is then rotated to the second stable position, thereby causing the flexible seal to radially expand and push against the bore of the pipe to seal it. The contacting member 111 pushes against the bore of the pipe to provide a reactive force to prevent the stopper from tilting during lever activation.

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Figure 2

20 A pipe stopper 201 having an elongate hinged handle embodying the present invention is shown in Figure 2. In the present embodiment, the pipe stopper 201 includes the pipe stopper 101 and a remote installation device 202. The remote installation device 202 has a sleeve portion 203 connected to an elongate handle by a hinge mechanism 205.

25 The elongate handle 204 is a single length of aluminium alloy tubing, but in an alternative embodiment it is formed from several telescoping pieces, such that it is adjustable in length. Materials other than aluminium tubing, such as steel tubing, which provide sufficient strength and stiffness may also be used.

As shown in Figure 2, the elongate handle 204 is several times longer

than the sleeve section 203. In this particular example, length of the sleeve section is approximately twenty centimetres (20 cm) while the handle is three metres (3m) in length.

5 **Figure 3A and 3B**

A side and rear view of the pipe stopper 201 of Figure 2 is provided in Figures 3A and 3B respectively. A section of the handle 204 has been removed from the drawings to allow the sleeve section 203 and hinge mechanism 205 to be shown in greater detail.

10 The sleeve section 203 has a socket portion 301 which is a close fit over the lever 106. The lever 106 is secured within the socket portion 301 by a pair of screws 302 which pass through holes in the socket portion and which are screwed into the lever 106. Thus, the sleeve section 203 is configured to be rigidly connected to the lever of pipe stopper 101.

15 The sleeve section 203 also includes a lever extension portion 303 which is rigidly attached at one of its ends to the socket portion 301. When the stopper 101 is located within the socket portion 302, the lever extension portion 303 extends in substantially the same direction as the lever 106 and provides an extension of said lever. The other end of the lever extension
20 portion 303 is connected to the handle 204 by the hinge mechanism 205.

The hinge mechanism comprises: a pair of parallel profiled plates 304 which are rigidly attached to the end of sleeve section 203; a central plate 305 which is rigidly attached to the end of handle 204; and a hinge pin 306 which passes through holes in all three said plates. The free end of the
25 profiled plates is shaped such that the angle between the handle 204 and the sleeve section 203 cannot become larger than a predetermined obtuse angle as shown in Figure 3A. At this angle the free end of the profiled plates 304

press against the lower end of the handle 204 and act as a stop. In the present embodiment the predetermined angle is 170 degrees, and this allows the pipe stopper to be easily positioned as will be described later. However predetermined angles between 150 degrees and 180 degrees are envisaged.

5 The free end of the profiled plates is also shaped such that the angle between the handle and the sleeve section may be closed by approximately 90 degrees.

 In an alternative (preferred) embodiment, the screws 302 are replaced by a retaining clip which serve the purpose of maintaining the attachment of the sleeve section 203 to the lever 106. In either case the remote installation device 202 is detachable from the pipe stopper 101 by unfastening the screws or retaining clip. Therefore, after use the remote installation device and pipe stopper 101 are separable.

15 **Figure 4**

 A demonstration of the use of the pipe stopper 201 is provided by Figures 4, 5 and 6. The pipe stopper 201 is shown lowered into a manhole 401 of a sewer in Figure 4. A user (not shown) remains above ground level 402 and manipulates the upper portion 403 of handle 204 by hand. The pipe stopper's seal 105 is to be positioned into the end of pipe 404 to seal it off.

 The obtuse angle between the sleeve section 203 and the handle 204 that is maintained by the stopping action of the profiled plates 304 allows the user to more easily bring the pipe stopper 101 into the end of the pipe 404.

25 **Figure 5**

 An enlarged view of the lower part of the pipe stopper 201 is shown in Figure 5, with the seal 105 positioned in the end of pipe 404. The coaxial

plates 102 and 104 are positioned by the user to be perpendicular to the axis of the pipe 404, with the assistance of the contacting member 111. The angle between the sleeve portion 203 and the handle 204 allows the seal to be located within the pipe 404 without wall 501 of the manhole interfering with the manipulation of the remote installation device 202.

When the seal 105 has been correctly positioned, the user pushes down axially along the handle 204. The pipe stopper's seal 105 is prevented from tilting out of position in the pipe 404 by the action of the pipe wall on the contacting member 111. Consequently, the lever 106 and sleeve section 203 are caused to rotate about the lever's pivot in direction of arrow 502, thereby actuating the cam 107 to bring plates 102 and 104 closer together and radially expand the seal 105.

Figure 6

The pipe stopper 201 is shown in Figure 6 after the lever 106 has been rotated to its second stable position and the seal 105 radially expanded to seal against the pipe 404 bore. In this position the angle between the handle 204 and sleeve section 203 is reduced to approximately 80 degrees.

Thus, the pipe 404 has been sealed by the pipe stopper 201 while the user remains above ground level and avoids having to climb down into the manhole.

When the user wishes to remove the pipe stopper, they again remain above ground level and pull axially on the handle, returning the lever to its first stable position in which the seal is not radially expanded. The pipe stopper is then removed from the pipe and the manhole by further manipulation of the handle 204.

Figure 7

An alternative pipe stopper 701 is illustrated in Figure 7. The pipe stopper 701 is of similar construction to the pipe stopper 201, except that the lever 106 and sleeve section 203 have been replaced by a single lever 702.

- 5 The lever 702 is formed from a plastics material moulded around a steel strengthening rod to which the profiled plates of the hinge mechanism are rigidly attached.

Claims

1. An expanding pipe stopper comprising a pair of co-axial plates; an outwardly expandable flexible seal located between said plates;
5 a positioning mechanism which maintains the relative positions of said plates in a first position in which the seal is radially unexpanded, a second position in which the seal is radially expanded, and provides a means for changing the relative positions of said plates between said first and second position, wherein said mechanism includes a actuating member which is
10 connected to an elongate handle by a hinging mechanism.
2. An expanding pipe stopper according to claim 1, having a means for preventing the hinge from opening past a predetermined angled.
- 15 3. An expanding pipe stopper according to claim 2, wherein said hinge is configured such that it is prevented from opening beyond a predetermined angle.
- 20 4. An expanding pipe stopper according to claim 2 or claim 3, wherein said predetermined angle is obtuse to allow the seal of the pipe stopper to be lowered below ground level and positioned within a pipe by manual manipulation of said elongate handle.
- 25 5. An expanding pipe stopper according to any of claims 1 to 4, wherein said actuating member comprises a cam member secured within a sleeve, and said sleeve is hingedly connected to said handle.

6. An expanding pipe stopper according to any of claims 1 to 5, wherein said pipe stopper further comprises a contacting member rigidly secured to one of said plates and configured to contact the bore of a pipe to provide a reactive force to tilting the stopper when located within said pipe.

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7. An expanding pipe stopper according to any of claims 1 to 6, wherein said actuating member comprises a cam surface acting on one of said plates such that rotation of said member changes the relative position of said plates between said first and second positions.

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8. An expanding pipe stopper according to claim 7, wherein said actuating member is pivotally connected to one of said plates and said cam surface acts on the other of said plates, such that the relative position of said plates is changed between said first and second positions by axially pushing or pulling said handle.

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9. A remote installation device for an expanding pipe stopper comprising:

a member configured to be rigidly attached to the lever of a pipe stopper;

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an elongate handle connected to said member by a hinging mechanism; and

a stopping means which prevents the angle between the handle and the member increasing beyond a predetermined value.

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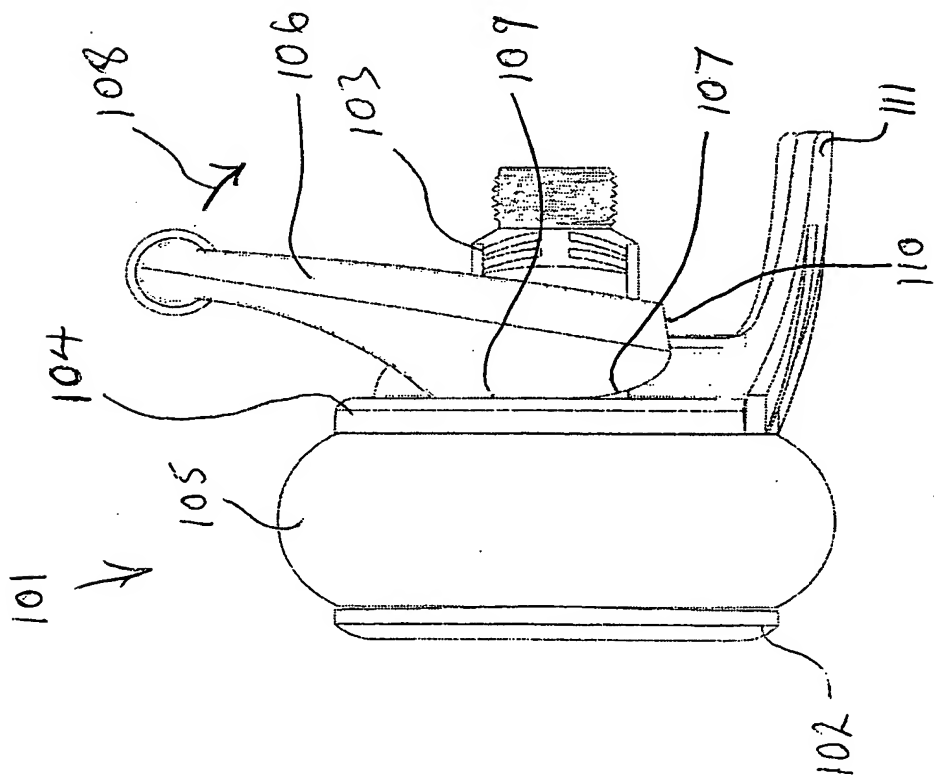


FIGURE 1A

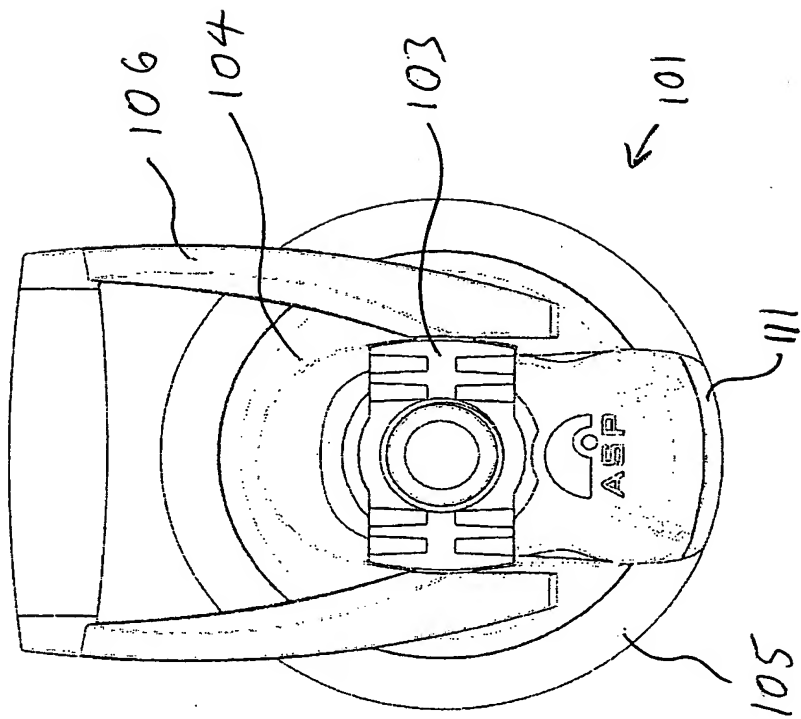


Figure 1B

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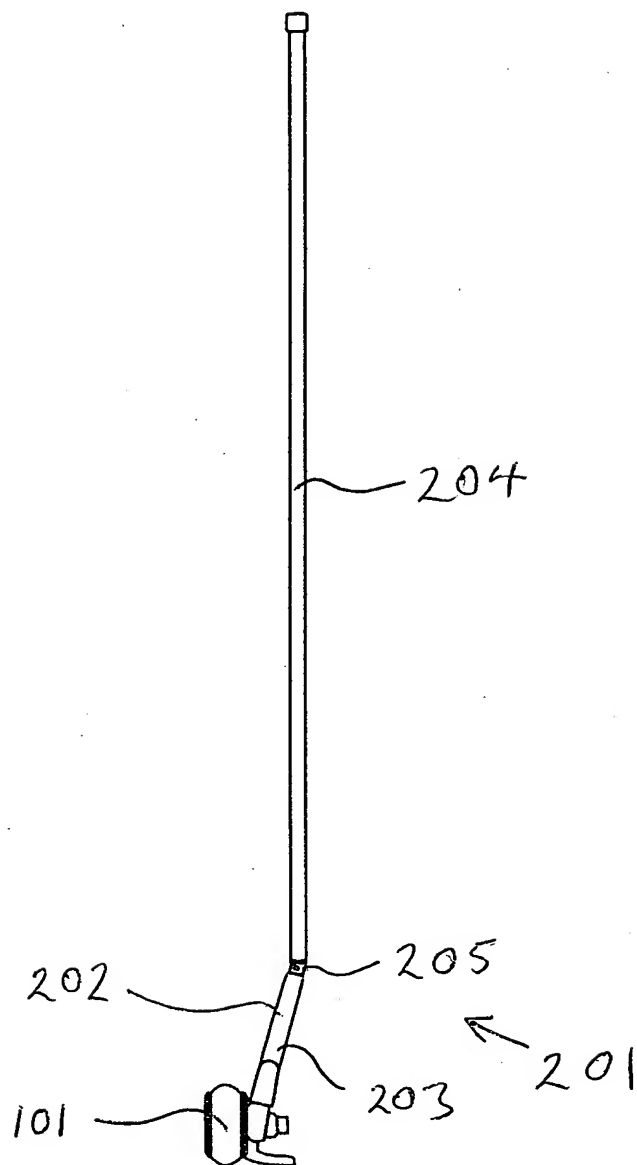


Figure 2

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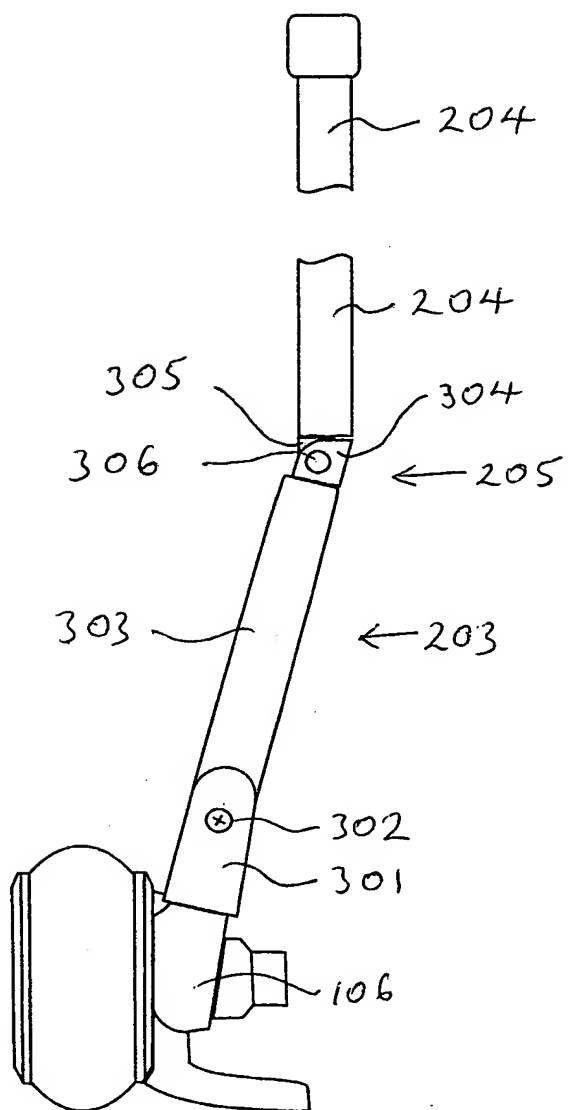


Figure 3A

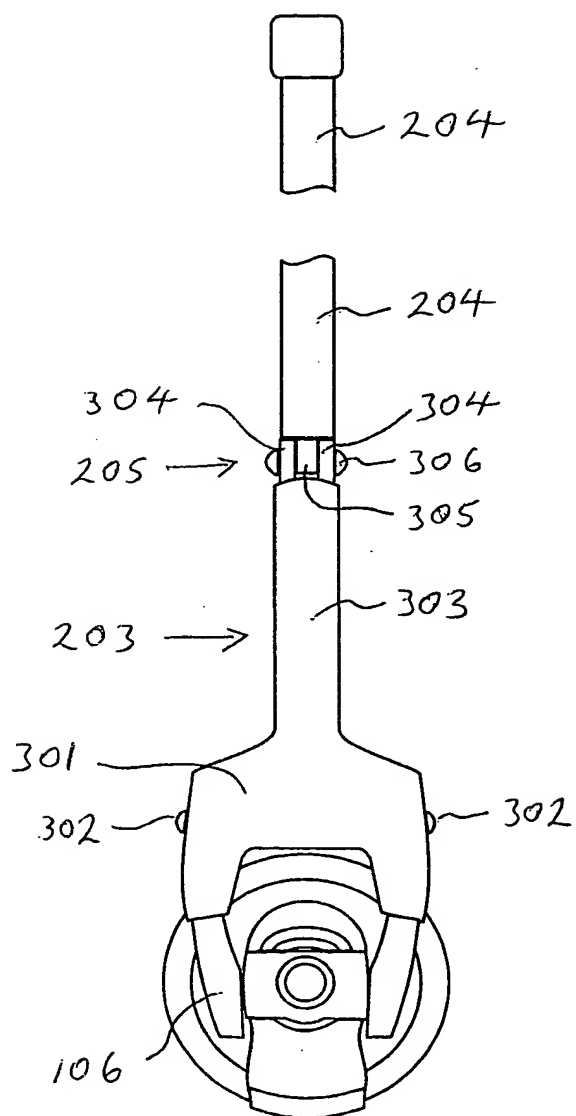


Figure 3B

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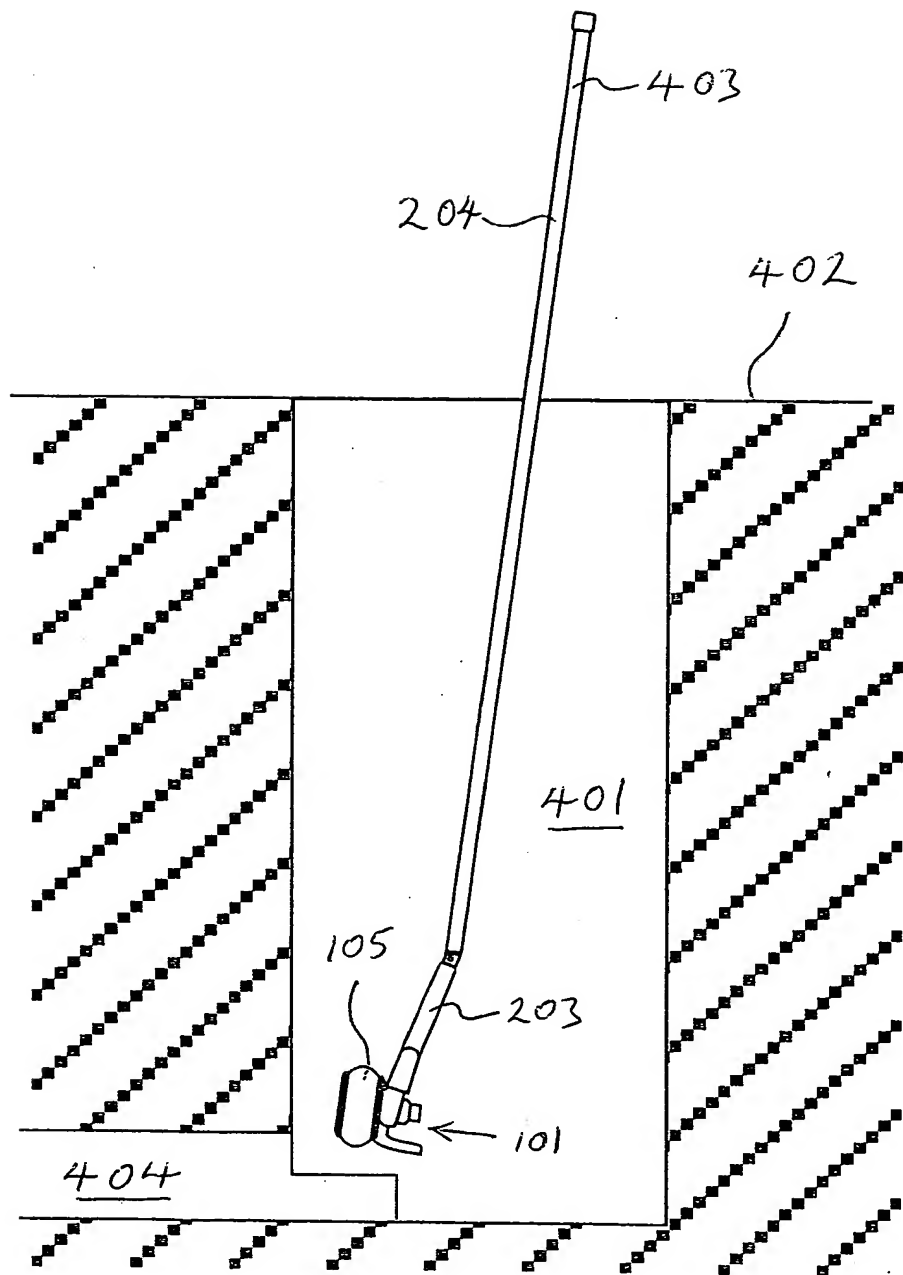


Figure 4

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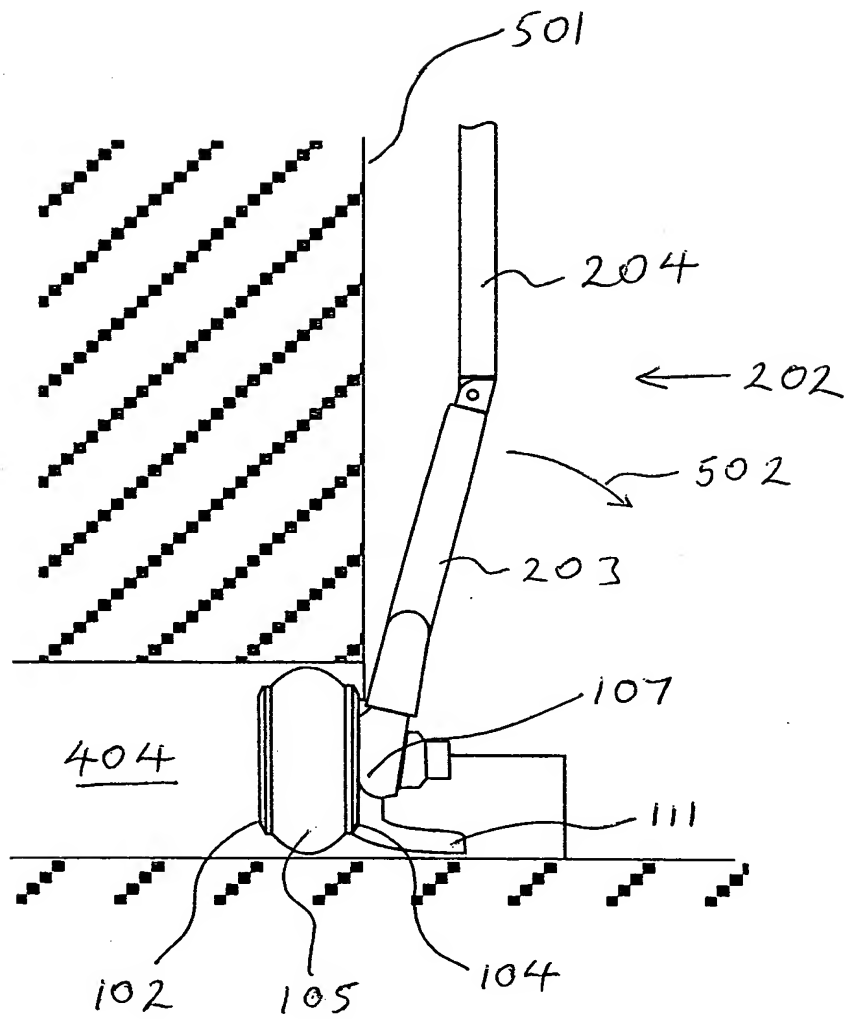


Figure 5

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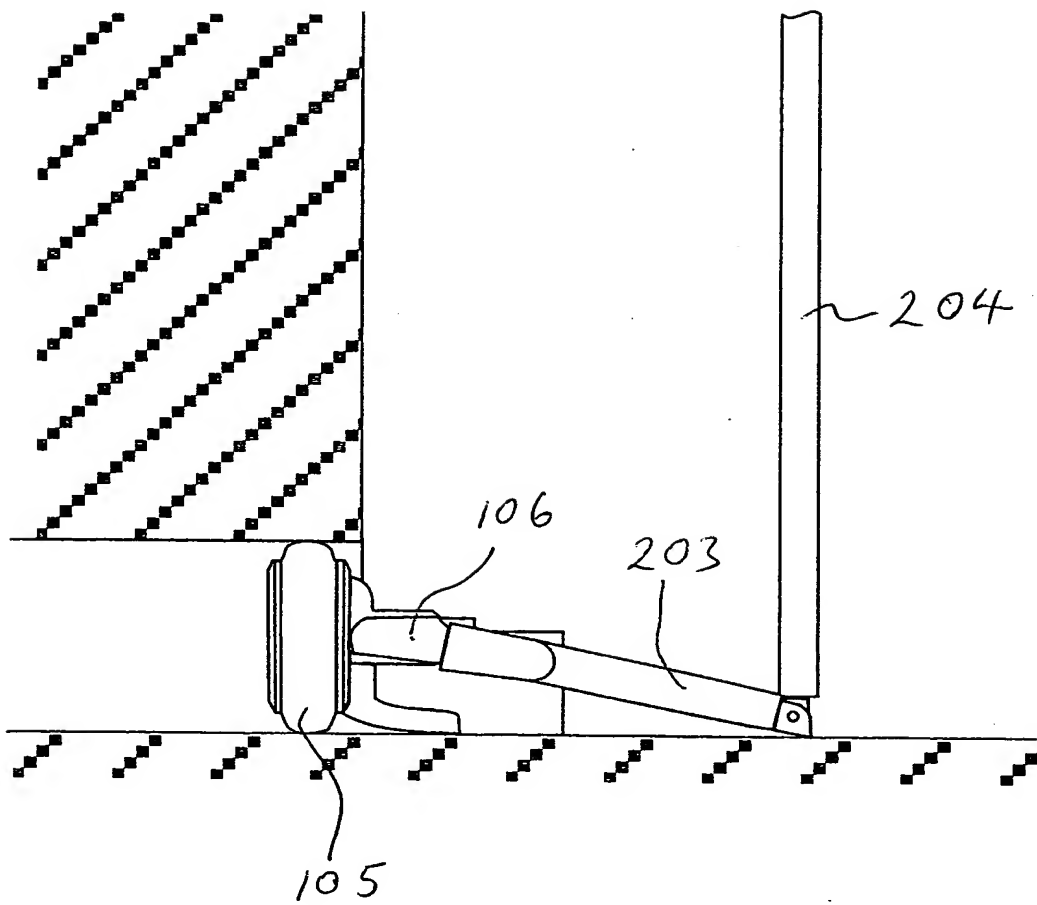


Figure 6

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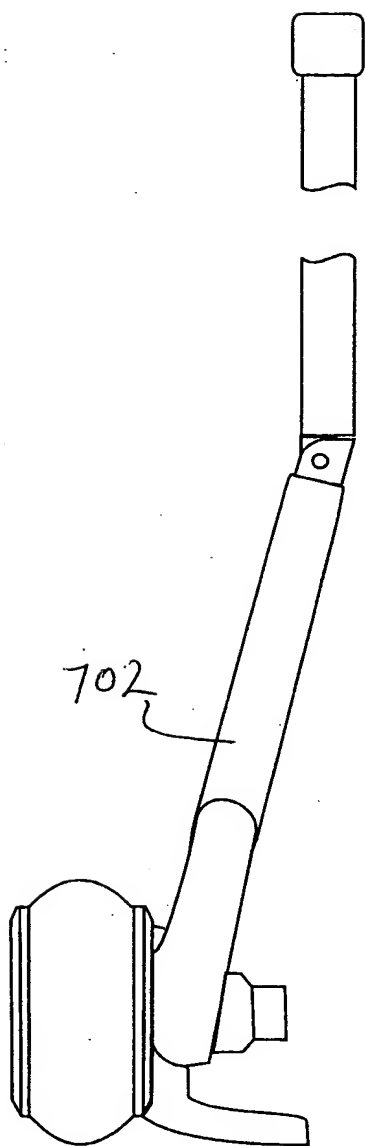


Figure 7A

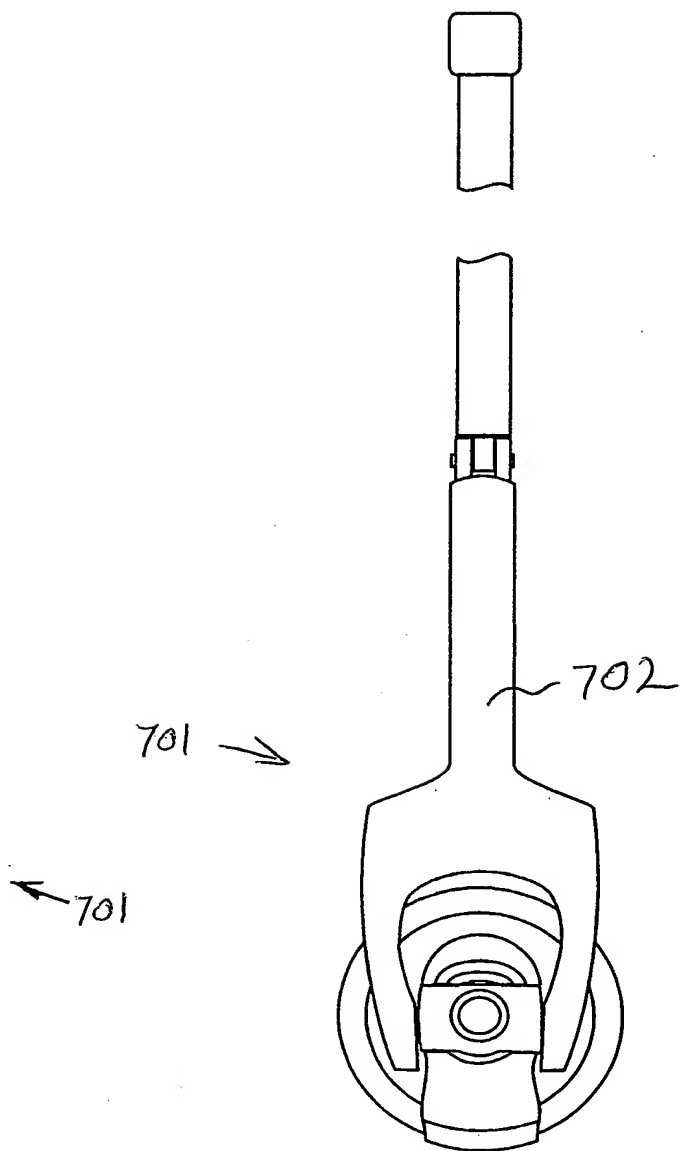


Figure 7B